Solid Hydrogen Particle Propellant (SHPP)

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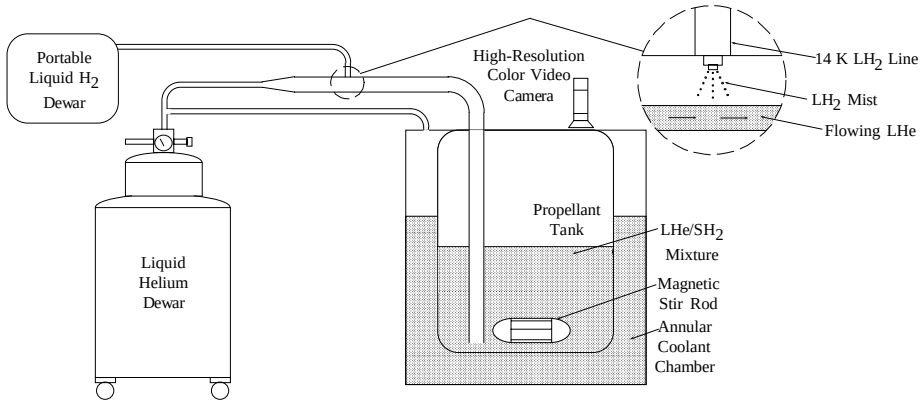
Description and Objectives

ORBITEC proposes to develop a new class of fuels consisting of solid hydrogen particles in a liquid helium carrier fluid. These particles would be ideal carriers for various High-Energy Density Materials (HEDM's), including high-energy metals or atomic free radicals. To demonstrate and test the new fuels, ORBITEC also proposes to develop a new bi-propellant engine. HEDM fuels using these metal and atomic hydrogen additives have theoretical specific impulse values that can significantly exceed those of conventional propellants. Development of clean burning, high I_{sp} fuels will enable SSTO vehicles and advanced, low-cost launch vehicle systems in the 21st century. Phase I work will experimentally demonstrate the particle formation techniques, and produce LHe/H_2 slurries. In addition, a preliminary design of a 20 lb_f thrust bi-propellant engine for use with slurry fuels will be developed. Phase II work will continue this development, fabricating and firing a 20 lb_f thrust LHe/SH_2 slurry - GOX engine, as we evaluate techniques to add HEDM's to the SH_2/LHe slurry.



Approach

Task 1. Design Particle Production Hardware
Task 2. Build Custom Hardware & Purchase Required Parts
Task 3. Leak Test System Components
Task 4. Conduct Particle Production Tests
Task 5. Evaluate Solid Hydrogen Particle Size
Task 6. Reporting

Subcontractors/Partners

None.

Schedule and Deliverables

6 Months

Final Report

NASA & Commercial Applications

(1) High-performance rocket engine or propulsion systems
(2) On-orbit, high-performance, high-thrust interceptor
(3) Advanced stages and engines for orbit transfer and launch vehicle boost
(4) Extremely high-performing fuels for air-breathing engines
(5) Use of solid cryogens for in-orbit and space-based cryogen coolers
(6) Earth-based cryogenic storage systems in the future hydrogen economy